

---

*Jennifer Stock:* You're listening to Jennifer Stock with Ocean Currents, a new show coming here to KWMR where we'll focus our topics about ocean ecology and biology and all the different amazing marine research that's happening out here in the ocean, not just in the Pacific, but worldwide. About seventy-five percent of our planet is ocean. So, truly we're talking about Planet Ocean here and all the topics that we'll be talking about.

Here on the central California coast we are blessed to live at the edge of one of the most productive marine ecosystems in the world. This is where we'll be bringing exciting research and exploration that's taking place. Also, that what's happening in the three contiguous national marine sanctuaries that are managed by the National Oceanic and Atmospheric Administration right out here at Monterey Bay, Gulf of the Farallones, and Cordell Bank, all of which we will be talking about on this show.

So, today we're going to be talking about the big blue, the big open ocean and we're going to be speaking with a biological oceanographer, Dr. David Hyrenbach, who I'm going to bring live on the air. David, are you there? David are you live on the air?

*David Hyrenbach:* Can you hear me?

*Jennifer Stock:* I can hear you.

*David Hyrenbach:* Okay, great!

*Jennifer Stock:* Great. I would like to introduce a little bit about your background to our audience and feel free to jump in if I'm bragging a little bit too much, but David is a biological oceanographer with Duke University in North Carolina. He's a research scientist and currently David is a visiting scholar at the Parrish Lab at the School of Aquatic and Fishery Sciences at the University of Washington. David's expertise lies in the habitats of far-ranging marine vertebrates, those are animals with backbones for some of us that may not be familiar, and the conservation of pelagic open ocean ecosystems.

He is interested in the physical mechanisms that define predictable foraging hotspots in the pelagic system and how we can combine natural history and oceanography to design appropriate management plans and marine protectant areas in the open ocean. David has experience with satellite telemetry, which we're going to talk about a little bit today to understand the ecology of some of

---

these highly migratory pelagic species, such as marine birds. I was lucky to meet David about six years ago while he was doing some work locally here and he told me about some big birds that come all the way from across the Pacific right here locally offshore to Cordell Bank and Point Reyes to feed and I was completely astounded by the stories he was telling about black-footed albatross that traveled from its breeding ground from the northwestern Hawaiian islands all the way here to Cordell Bank a couple times.

So, I'm hoping David will talk a little bit about that today because this is a common occurrence from what we understand. So, here we are. David, thank you so much for joining us. We're so lucky to have you call in and talk a little bit about your experience because so few of us actually have any encounters with these amazing vertebrates traveling all over the ocean and since this is your lifestyle and your experience, we are so thrilled to have you.

*David Hyrenbach:* Yeah, thank you very much. First of all, I want to congratulate for this really cool radio program. I think you told me today is the first day? I'm very proud, privileged to be your first invited person and yeah, I'm really pumped up to tell you about all of these amazing animals that are coming right to your backyard from all throughout the north Pacific Ocean. As you said, they come at different times of the year as part of their lifecycle migrations to use some of the very productive waters that occur right there off of Cordell Bank and the Gulf of the Farallones and the Monterey Bay Canyon. So, let's see...you started out saying some of the reasons why I'm interested in the ocean. So, maybe I can elaborate a little bit on that; why the open ocean is such a fascinating place to study.

*Jennifer Stock:* Yeah, can you also back up a little bit...

*David Hyrenbach:* Yeah.

*Jennifer Stock:* ...and tell us how you got interested in that as well and your career with your degree in biological oceanography. Just tell us a little bit about your initial interests and then let's go into a little bit more of the research that you've been going through.

*David Hyrenbach:* Sounds very good. So, first I'll tell you what a biological oceanographer means. It's a very almost pompous name, but basically what it means is I study biological processes in the ocean. So, what this means, biological processes -- it's interactions between animals and the ocean. For example, how does the temperature of the water effect the growth rate of an animal that

---

lives immersed in that water or how does the temperature and the movement of the water, the currents, effect how food is produced and how animals find that food -- How they make a living?

How then the food webs get set up in the ocean and eventually how the energy flows from the sun via this photosynthesis into the plants at the basis of the food web, which is the phytoplankton, these tiny microscopic animals, little plants that are floating around in the ocean and going up and down the water column. How these little plants get produced. Things eat them. Bigger things eat the planktonic grazers, like the little cows of the ocean that eat this primary production and how all of that eventually leads up to the big animals like the big whales, the tunas, the swordfish, the sharks, the seabirds that are eating fish and squid and plankton way up in the food chain.

So, basically that's what it means. We're trying to look at all of the connections between the animals of the environment and then...or some animals with those animals that eat them and also with their prey.

*Jennifer Stock:*

That's excellent. Excuse me. That's wonderful to hear because I think the vastness of the huge Pacific Ocean, just the Pacific alone, for so many people it's just so unfathomable and it's wonderful to bring some of this information to our listeners and to schools and the public and that somewhat my role as the education outreach coordinator for Cordell Bank National Marine Sanctuary is to bring this stuff to the light because so many of us are not going to have experiences hundreds of miles from shore and have no idea that there is so much life out there.

*David Hyrenbach:*

You know, and as you say, many people don't really have a chance to go out and experience really the open ocean. Like you say, hundreds of kilometers away from the coastline where you have these very, very large features. Different currents bringing different types of water together, different habitats moving along, changing very fast in time and in space, but I think the really critical thing is when you go out to the open ocean for people who have, say, flown in a plane from California to Hawaii or gone on a cruise, you know, out in the open ocean, you look out the window and often the sea looks really boring, you know?

It looks very empty it's all the same clear blue. You almost think, "Wow, you know, it almost looks like a big desert." It doesn't seem to be a pattern or, you know, any predictable features that the animals can use. You know, if you think of a forest, for example,

---

right? You know you see the trees then there's the understory bushes. You know, there's gaps in the tree and the canopy. You go there year after year and the forest is in the same place. There's some changes, but it seems to be a feature you can recognize, You can revisit, right?

*Jennifer Stock:*

Definitely. I completely agree and from my experience coming out to sea, I've had an opportunity to participate on some of the sanctuary-led cruises out here is that there will be days where there's just not a whole lot going on and then all of a sudden there's birds attacking the water and there's marine mammals coming from all over the place and it's definitely the surface feeders, those animals that are coming on top of the water that are giving us signals about what's going on underneath.

But, I imagine that's a little bit hard to do hundreds of kilometers away when we can't necessarily see them on a boat because, you know, getting out and spending time on the water costs money and takes lots of time and there's so many adverse reasons why we don't get out there as often as we'd like to, but I understand there are quite a few different tools that oceanographers such as yourself use to learn about the open ocean processes and some of the animals that are on them. Can you talk a little bit about some of the tools that you've used and are using to learn a little bit more about this open area?

*David Hyrenbach:*

Yeah, of course. Okay, so, let's see...Our research is motivated by three main questions, I think. The first one is, like you say, the ocean looks very heterogeneous, which means very, very different as you move along in space and it also changes from season to season from year to year and we want to understand how do these animals make a living in this very complicated and dynamic, this very changing environment? Okay? How do they find food? How do they find their way to migrate across this vast landscape.

Then also because, you know, I'm an oceanographer I want to learn about how the whole ocean ecosystem functions and if we study some of the animals at the top of the food chain that take advantage of all of those other steps that have happened underneath involving the little plants, the phytoplankton, and the plankton all the way up as the energy flows up to the prey that they can eat, if we study the animals at the top we have a good feeling that we can understand what is happening below, right?

What are the mechanisms that are producing the food that they are using? So, that's another reason to focus on some of those big

---

animals that range very far and live very long and feed on top of the food chain. And then I think the third reason is, you know, a lot of these big animals that live for really long are impacted by human activities. They're killed by fishers by mistake or they absorb pollution in the environment or they've been harvested in the past without really good management. So, more and more our work is geared towards understand how are these populations affected by people and are they recovering in those instances where impacts have been stopped.

Okay. So, how do we do this? How do we answer these three questions? Like you said, a lot of the time we go on ships and it's very, very convenient because even though it's very expensive I'll give you a sense that one day of ship time can cost anywhere between ten-thousand and thirty-thousand dollars. Depends on whether you have a nice breaker that is very expensive or a smaller non icebreaker-type boat.

So, we go out on ships and we make all of these different measurements. Remember, we're trying to understand the whole ecosystem. So, some people measure the physics of the ocean. What's the temperature of the ocean? What's the salinity? How much light penetrates into the sea? Other people measure the phytoplankton. Other people measure the fish. We count the birds and the whales and then we try to put it all together.

*Jennifer Stock:*

And a lot of the putting together, doesn't that occur after the cruise is done and there's data processing or how much of it is actually done while you're on the water versus, you know, analyzing all of this data later on when you get back to land?

*David Hyrenbach:*

You know, a lot of it is actually done on the fly as we go because remember, the, you know, in the ocean unlike on land the features are always changing. You know, you may be following a specific blob of water that you're interested (in) where there's a lot of productivity and these things are moving along and changing shape and size. So, we often process a lot of the information as we go and use pictures from satellites, other devices that give us big images of what the ocean looks (like) in a very large area around where we are working with the ship to really get a sense of what's happening because, again, when we take samples we take very small...it's almost like taking...like opening a tiny little window into the ocean and look...peeping through a little hole, you know?

And then we just have a very fast photograph of what's happening in a spot, but we need to understand what's going all around. So, a

---

lot of the processing of the data happens as we go, but then a lot of the really intense processing, like counting how many animals of different species were found in different net samples or, for example, a lot of the analysis that involve adding isotopes to the water to look at how much the phytoplankton is growing, all of those measurements can only be done in a lab setting. So, often, you know, it takes months in a lab setting after we get back of processing and synthesizing of the information and then we have the ability to put all of the pieces together.

*Jennifer Stock:* So, what are some the samples that you're collecting in the nets and what is that for...for, I mean, is that just to get samples of the prey that the birds or the mammals might be eating while you're sampling in an area?

*David Hyrenbach:* Yeah, that's right. For example, I'll give you...I'll talk a little bit about some work that we did up in the Bering Sea trying to understand how the productivity happens there in late spring and early summer and how eventually that productivity leads up to food for shearwaters. These are birds, the short-tailed shearwater, that are coming all the way from Tasmania, south of Australia every year. They fly all the way up to the Bering Sea. They're up there in spring, our spring, our summer, and in our fall, then they head back south and we wanted to understand how...how are some places really rich and productive in terms of producing food for these shearwaters and other places don't seem to really produce the food that they need?

And this happens both spatially, some areas around say, the Pribilof Islands, some shallow places where there's a lot of nutrients being brought up to the surface lead to very large aggregations of krill, which are the little tiny shrimps that these birds are foraging on, compared with other places where, you know, apparently on the surface everything seems to be just like it was at the other spot where we had the big swarms of krill, but there was no prey. So, we were taking nettos. Basically, you submerge this net in the water to a given depth. You have a device that tells you how much water is being filtered through this net so you can tell how much water you...you are sort of collecting the plankton over and then the plankton gets all accumulated at the end of the net in what's called the "cod end" which is retrieved and then you do different things with it.

You figure what is the volume of that amount of plankton. You can also look at the weight of that amount of plankton and then you

---

can also sort it. You can separate it by species and different age classes. You can, you know, get a sense.

*Jennifer Stock:* Yeah, I have to say, that is one of the most fun jobs to do when I got to participate on one of our Cordell Bank sanctuary cruises. We did some net tows at night and it's a tough shift. You start at ten o'clock at night and go all the way until four in the morning. So, you don't really see the day...the daylight.

Luckily we had a full moon that week, but just for some of the listeners that might not be familiar (with) what's in the bottom of that net, but it is absolutely amazing the amounts of krill that you get, but you also get tiny little zooplankton such as crab larvae. We got tons of Dungeness crab larvae in all of these funny shapes with these big eyes staring out at you and squid larvae. So, I'm sure you're getting the same thing up there and it's just absolutely fascinating to sort through it and see the diversity that's in the water where we can't see it. It's a really cool part.

*David Hyrenbach:* A lot of those creatures, they look almost like extraterrestrials, you know, like that movie, *Alien*. There are these arthropods that live on jellyfish and actually, some of them will burrow and eat a little hole in the jellyfish and they live in there...

*Jennifer Stock:* Yes.

*David Hyrenbach:* ...and they really look scary. You're really grateful that they're, you know, barely a couple centimeters big because if they were, you know, six feet tall they would be extremely scary looking.

*Jennifer Stock:* We actually have some models of these plankton in our sanctuary office at Cordell Bank. I don't know if you've been down here recently, David, but we've got models of these plankton six thousand times their real size on our ceiling. So, we have a six-foot krill. If anyone wants to see that, come on down to our office over at the red barn, but I also just wanted to ask you again, are these sooty shearwaters that you're talking about that were coming up to the Bering Sea because they come all the way up the coast of California as well, right?

*David Hyrenbach:* You know, actually, the ones that go up into the Bering Sea are short-tailed shearwaters. They're very closely related to the sooty shearwaters..

*Jennifer Stock:* Okay.

---

*David Hyrenbach:* They both breed in the southern hemisphere. The sooty shearwaters, like you said, they come all the way to California, Oregon, Washington, the gulf of Alaska, but they don't seem to really go into the Bering Sea and people right now, if they go out to anywhere along the coast of central California, you know, places in Monterey Bay or if they go out on a pelagic trip out to Cordell Bank they should be able to see huge flocks of sooty shearwaters right now.

*Jennifer Stock:* Right.

*David Hyrenbach:* Yeah. Arriving and, you know, making...just gorging themselves with food in the California current area.

*Jennifer Stock:* That just blows me away. I know that short-tailed shearwaters are one of many species that do these incredible migrations from southern hemisphere to northern hemisphere, but thinking about that movement, actually, that natural history behind that, how do they know that that's where they're supposed to go? How do seabirds know where they need to travel with that entire vastness of blue and ocean? What are some of the senses that sooty shearwaters, short-tailed shearwaters, all sorts of seabirds have in order to find out where they need to go to get food? Its kind of like me having to walk to New York to get a piece of pizza and then come back to California.

*David Hyrenbach:* Yeah, you know, it's...that is one of the biggest questions that motivates a lot of this tracking research where researchers will attach devices to animals like a radio transmitter, for example, or a little instrument that measures light intensity over the entire year that they're out in the ocean and then you can recreate their path by recreating the latitude and longitude where they were on a given day. So, you know, we're spending a lot of time and energy mapping where the animals go at different times of the year, especially they undergo these big migrations, but, you know, to tell you the truth, there are so many different conflicting schools of thoughts that say and potential senses that these animals are using to navigate these very big seascapes that we don't yet have a really clear answer of, you know, they're using x or they're using y.

I'll give you some examples. Most likely, they're using a combination of senses, you know, and the evidence for this is there's been many studies where people glue, say, a magnet on top of an albatross head or on top of a turtle head and the idea is that if these animals are using the magnetic field on the Earth, if you distort that magnetic field by putting a magnet on their head, they



---

should not be able to find their way, right? Well, whenever people do this, you know, they have an albatross say in the colony, they put a magnet on its head, they put a transmitter on its back, the bird goes out to sea and they always come back home. You know, and the researchers sort of pull their hair and they wonder and they sit around and question, but the birds always find their way. So, most likely, you know, they're using more than one sense...

*Jennifer Stock:* That is amazing.

*David Hyrenbach:* ...and also, another thing to think about is like the same way when you go to get a piece of pizza, let's say you're not going to New York, but maybe you're going to like, Point Reyes from your house, you know, you have also like a shopping list of rules that you use, right? You know, you don't put on top of your list, "Get out the wallet and pay for the pizza," right? First, you have to say, "Okay, find my car keys," or, "Find my bike helmet."

*Jennifer Stock:* Right.

*David Hyrenbach:* Right. Get on the bike. Drive straight until I get to town, then look for the red building, go inside, find the pizza I want, and so forth, right?

*Jennifer Stock:* Right.

*David Hyrenbach:* So, most likely these birds are using a similar hierarchy of decisions. You know, let's say you were in Hawaii and you wanted to come to Cordell Bank, you know, maybe the first rule would be, "Well, I need to move north," and, you know, maybe it all it takes then is knowing where is north and where is south, which you can do either if you have a magnet in your head or you can do that by looking at the...where the sun sets and when the sun comes out, right? But, you can have a sense of where directions are that way. Then maybe another...then you could have a different rule where you say, "Well, okay, you know. As I move north the water is getting colder and its getting greener. So, that tells me..."

*Jennifer Stock:* Getting closer, getting closer!

*David Hyrenbach:* ...I'm getting to a productive spot. Then once I see that I switch my rules and then I look for, you know, prey patches or I look for boats if I am looking for bait that I'm going to be stealing from boats. Those kinds of things. So, most likely, they also do use a set of rules, you know?

---

*Jennifer Stock:* Interesting.

*David Hyrenbach:* Yeah.

*Jennifer Stock:* So, what are some of the...you were talking about some of this...well, magnets on the heads, that's definitely one tool that sounds like it's been used and maybe still is being used, but you're also talking about tracking these birds and this is...when I met you a couple of years ago you were absolutely amazing me in the fact that we were tagging birds and finding out where they were travelling all across the Pacific and you've been involved in some albatross tagging studies here locally off Point Reyes with some collaborators and I was wondering if you could tell us a little bit about this. I know that listeners might have heard about this tagging study a couple of years ago, but it's still going on. I'd like to bring it back since you're about to embark tagging in another month or so.

*David Hyrenbach:* Yeah, that's right. Yeah, so, I'll start out telling you very briefly about the species we study, which is the black-footed albatross, and this is a very large-bodied bird. The wingspan is about two meters, which is about six feet. So, about my height and then they're about three kilos and a half, which is about seven to eight pounds. So, they're very large-bodied birds.

When I first started studying them, I did so in Tern Island in the northwest Hawaiian islands and the really amazing thing is at the time we deployed these little transmitters on their backs that would talk to satellites, the weather satellites, and would allow us to follow the movements of the birds. So, to give you a sense, Tern Island is about four thousand five hundred kilometers from California, about three thousand miles from California...from central California and about three thousand two hundred kilometers from the Aleutians. Well, there were birds at this place in Tern Island that were regularly going to central California and to the Aleutians to get food for their chicks.

*Jennifer Stock:* During...while the chick is waiting for them, of course, to come back.

*David Hyrenbach:* That's right. So, the chick was in the nest, the, let's say, husband and wife birds were going out to sea and they were spending up to twenty four days out at sea coming all the way, for the case of the black-footed albatross that I'm talking about, coming all the to California, going to Cordell Bank waters, Monterey Bay, Gulf of the Farallones, going a little bit up into B.C. and then going back

---

home and feeding the baby and then doing sometimes short trips right around the Hawaiian islands. Those were about two days, three days. So, again exploiting very, very different habitats and over a very vast expanse of the north Pacific.

*Jennifer Stock:* And this is happening right now, they're breeding currently right now in the northwestern Hawaiians, correct?

*David Hyrenbach:* That's right. This pattern I'm describing happened between February and June. Then at the end of June the adults leave the colony and the babies are left. They're very fat at the time. They lose some weight and then eventually, I think when hunger really gets them motivated the chicks will actually fly away and then go out to sea for about four to six years until they come back to the colonies to reproduce.

*Jennifer Stock:* That's absolutely amazing.

*David Hyrenbach:* It's pretty amazing and to give you an example there was one bird that we captured in February off southern California, off San Diego, and this bird was really dark. It was a black-footed albatross that looked really dark. So, we thought it looked like a really young bird and we grabbed him off the water, looked at the metal band that the fish and wildlife service people had put on this bird and we found out that this bird the previous July had been banded when it couldn't fly in Tern Island.

So, between that February when it was banded, then in July it left, the next February when we caught it, the bird had come all the way from Hawaii to California where it was, you know, it had found this very productive place, part of the ocean, you know, sitting there making a living. You know, in three or four more years he would eventually go back to breed, but as you can imagine this part of their life is really poorly understood.

*Jennifer Stock:* Amazing. We're, you know, we're just coming up on the half hour and I'd like to take a short break, David...

*David Hyrenbach:* Okay.

*Jennifer Stock:* ...and then when we come back I'd love to talk a little bit more about some of the tagging that's been going on right off of California here off the sanctuaries right out of Cordell Bank. I'd just like to let our listeners know that they're listening to KWMR in Point Reyes station on ninety point five FM and eighty nine point three in Bolinas and this show is called *Ocean Currents* with

---

Jennifer Stock. We're gonna take a short break and when we come back we'll continue talking with David Hyrenbach.

*Jennifer Stock:* You're listening to Jennifer Stock with *Ocean Currents* and we're talking with Dr. David Hyrenbach, a research scientist, research biological oceanographer out of Duke University and I'm going to bring David back on and David, let's go back and talk about those albatross again because I actually have quite a bit of an obsession with them as many of the listeners out here in west Marin might know and I'd love for you to talk a little bit, again, about that bird you saw off of San Diego and also let's talk about the tagging that's taking place right off here at Cordell Bank.

*David Hyrenbach:* Yeah, I'm pretty obsessed about them too, so I'm happy to keep talking about it. Okay, so like I was saying...I was trying to build this picture stating how important the waters of Cordell Bank, Gulf of the Farallones, and Monterey Bay are for black-footed albatrosses during the breeding season when, again, they're flying from the northwest Hawaiian islands all the way to the shelf area, this productive region of central California, feeding and then bringing food back to the colony to feed their chicks.

So, you know, this was documented using satellite tracking, right? Instruments that get glued on the back of the bird with tape, with this heavy-duty adhesive tape and then talk to a satellite and the researchers eventually get a little email from the bird they stick it to that says, "Hello, I am bird number five and on Monday at this time I was at this position..."

*Jennifer Stock:* That's so nice of them to do that.

*David Hyrenbach:* ...and I went here and I went here and I went here." Yeah, it's really addictive to get these emails from the birds. It's really great. So anyway, this was documented during the breeding season and then this goes, again, from January 'til the end of June. In July the adults leave the colony and nobody really knows where they go. From ships we know that we see albatrosses all the way throughout the north Pacific, you know, from a little bit south of Hawaii all the way to the Bering Sea and from Japan to California, but nobody had ever followed individuals only using bands, but a band only tells you one point, you know, the point where the animal was banded and the point where the animal was maybe killed in a fishery or it was collected by scientists.

So, not a lot of information, you know, just a straight line separated by often years, but now with this satellite tracking

---

technology we can actually get very, very fine maps of where animals are. We can get about ten to twelve locations per day. So, we can start mapping places where they travel very fast. So, they're basically going to the store. They're just commuting through. We can map places where they slow down, where they turn a lot so they may be looking for food. You know, we're really getting a good sense of how they make a living.

*Jennifer Stock:* Also, you're getting a better sense of where they're spending most of their time in the ocean and from what I understand, black-footed albatross and other albatrosses are actually quite endangered according to the IUCN, which...what's the IUCN stand for again? The International...?

*David Hyrenbach:* It's the International Union for the Conservation of Nature.

*Jennifer Stock:* That's Right.

*David Hyrenbach:* Yeah, and you're right. Actually, more and more...remember the three reasons I mentioned early on of why we study these animals. The third reason is because more and more we are realizing that they are in trouble for a variety of reasons and we also want to know whether they will be in trouble in the future given, you know, scenarios of global warming and things like that. So, albatrosses are really being hard-hit. Like you said, there's about twenty one recognized species right now of albatrosses worldwide and nineteen of them are listed in this IUCN list.

So, it's a pretty bad record and the problem as you know, like I said, they live really, really long. So, they reproduce infrequently. They don't breed every year. So, it takes them a really long time to go through adolescence, if you will, and start reproducing and, you know, they're being hit by things like fisheries bycatch, the incidental mortality in fisheries like longlines and also because they live so long they take a lot of pollutants and they eat a lot of plastics and things like that, which, you know, in the long term can have a really detrimental effect on these birds.

*Jennifer Stock:* Yeah, I want to get into this plastic thing a little bit...

*David Hyrenbach:* Yeah.

*Jennifer Stock:* ...but this coming July you're going to start tagging with a group called Oikonus Ecosystem Knowledge and they're one of the

---

collaborators on this project and you're going to be tagging how many birds and where are you going to be doing it from?

*David Hyrenbach:* Okay, this will be the third year that we do this and what we've been doing is in collaboration with Cordell Bank. Also, we've been going out with the sentry boat to right on top of Cordell Bank where there's a lot of black-footed albatrosses in July and we take some birds, we glue a tag on them, and we see how they move around anywhere from one to about...our tracks so far have been about one to two months long. We got nine birds in 2004 and 2005 and then this year we're going to do ten more starting at the very beginning of July and the really cool thing is that anybody can go and look at the tracks of these birds in real life. You know, every day the new positions get plotted. You can look at the spaghetti loops of how they're moving around.

*Jennifer Stock:* I love this, actually. This is one way because unfortunately, sitting in an office quite a bit doing lots of different kinds of work, but one thing I look forward to every day this time of year is being able to check in and see where is so and so today and it always brings up questions to me as to, "I wonder why they went there?" And following...and wondering if there's food there and if there's other birds there. It's really exciting to do and you can do that off of a website, correct? You're collaborating with a website to do that?

*David Hyrenbach:* Yeah, I think the best place where listeners could go is if they go to the Oikonos website. I'm going spell it out for you. There you can find links to the tracking from the last two years archived and you can also follow day-by-day the progression of the new birds we're going to track...

*Jennifer Stock:* Excellent.

*David Hyrenbach:* ...and there's a lot of background information and information about plastics and things like that. Okay, so if you have your pencils ready the address is W-W-W dot O-I-K-O-N-O-S dot org and the best thing is to go to the "What's New" page and all the updates will be posted there.

*Jennifer Stock:* Excellent.

*David Hyrenbach:* Yeah.

- 
- Jennifer Stock:* So there will be a link from the Oikonos webpage to the, I think it's sea turtle dot org where you can login and get an email update everyday, right?
- David Hyrenbach:* That's right. I think that may be the easiest shortcut. Otherwise, you could also go to the sea turtle dot org, like you mentioned.
- Jennifer Stock:* I've done that one before and it's actually really difficult to actually find the bird products. So, definitely go to Oikonos, but...so, you've been doing this for three years and...
- David Hyrenbach:* Three years.
- Jennifer Stock:* ...three years. You've got some birds that you've seen some of the track lines of where they've gone and where's the farthest distances that you've seen so far just during that period of time when they're tagged in Cordell in July?
- David Hyrenbach:* Okay, so we've had so far eighteen birds. Nine were males and nine females and the farthest these birds have gone in about two months' time is all the way to Hokkaido, Japan.
- Jennifer Stock:* That's amazing.
- David Hyrenbach:* Yeah, it's really amazing. There's actually, if your readers can get the Hydrosphere Newsletter from the National Marine Sanctuaries, the spring 2005 issue has a little story with a map showing the travels of one of these albatrosses from the first year, "Zubenelgenubi," who went...this bird was tagged on August eighth in Cordell Bank and September twenty second he was north of Hokkaido making it's way to the Kuril Islands. This is over seven thousand kilometers away.
- Jennifer Stock:* That's amazing.
- David Hyrenbach:* Yeah, really incredible and, you know, the really amazing thing like you were saying earlier is, you know, the United States has jurisdiction over a very fine sliver of ocean that surrounds Hawaii and some of the other territories in the mainland. This is the Exclusive Economic Zone.
- Jennifer Stock:* The E.E.Z.
- David Hyrenbach:* This is only two hundred miles long. Well, these birds are coming in and out of that zone. They're going into Japanese waters, Russian waters, Mexican waters, Canadian waters and, you know,

---

by doing so they are becoming susceptible to a lot of unregulated fisheries out in the open ocean, you know, where they spend about sixty percent of their time. So, I think knowing where the birds go and how they spend their time and how different countries are responsible for their ranges of the birds and for the places where their national fisheries overlap with those birds, I think it's a very powerful tool to motivate conservation collaborations across countries to protect these birds.

*Jennifer Stock:* That's wonderful. So, you're probably using a lot of these results towards looking at better ways to manage these area that are hard to manage because they're not in the Economic Exclusive Zone...Exclusive Economic Zone for the U.S., the E.E.Z. So, you're probably taking these findings to different research presentations and organizations and how are you taking these types of results internationally and maybe you're not there yet since it's very early on, but what would be the process you do to start working internationally with them?

*David Hyrenbach:* Well, you know, we've been very fortunate to work with a person called Kimberly Rivera who is a NOAA representative in charge of seabird bycatch issues and she is very excited about pushing forward international cooperation with other countries to work across these jurisdictional boundaries and with her we've been making our information available to what are called regional fishery management organizations. These are international management organizations where different countries get together to manage a specific fishery in a specific part of the ocean.

A very famous example of this is what's called the Inter-American Tropical Tuna Commission. I'm sure a lot of your listeners are aware of the tuna-dolphin controversy that happened in the tropical Pacific. This issue was managed by this Inter-American Tropical Tuna Commission. So, the same thing, you know, we are making our information available to these fishery organizations and the idea is that if we empower them, if we tell them where the birds go and we show them that they're responsible for their protection and conservation, then we're putting the ball on their court and then they, through their member countries, can push forward agreements to monitor, say, incidental mortality, to figure out how much discards...how much food, refuse, you know, from processing fish they're putting off to the side and these birds are eating, those kinds of things. So, it's a nice way to get countries involved across boundaries in the management of the entire ecosystem and the protection of the birds.



---

*Jennifer Stock:* I know for short-tailed albatross, which are severely endangered, up in...is it Alaska where they have a certain catch limit that a certain amount of birds, if they're caught, then the fishery shuts down, correct?

*David Hyrenbach:* Yeah, that's right. So, you see, this is another way, again, to put the ball on the court of the fishery organizations by telling them where the birds are concentrating then they can try to put in place management regimes to try to not kill the birds and often there are...it's sort of a stick and carrot approach. The carrot is you give them the information of where the birds are so they can be avoided and the stick is if a given number of birds are killed in a fishery in a given amount of time, like a year, then some of the fisheries may be closed. So, you know, the idea is to work, you know, across disciplines and to try to share information and ideas as much as possible and you mentioned international meetings and things like that, there's been a lot of work.

We have a workshop in October where people who study highly migratory birds are all getting together to share information about where there species go and there's another big, big effort from Bird Life International to make a big database of all the species that are being tracked to highlight places where they go and places where a lot of different species are using because, you know, if you have more reasons to protect a given part of the ocean because more species visit it, the more likely that part of the ocean will actually be protected. So, that's the rationale, you know, behind this effort.

*Jennifer Stock:* I just want to take a break here to let people know they're listening to KWMR, Point Reyes Station at ninety point five FM and eighty nine point three in Bolinas. You're listening to Ocean Currents. We're talking with Dr. David Hyrenbach a researcher who is doing lots of interesting work on the open ocean with seabirds. So, David, there sounds like a lot of this work is very related to fishery information since that is one of the largest threats of open ocean birds and seabirds, especially those albatrosses since they're surface-feeders and are looking and smelling for all of that bait, but

I know there's other threats that are much more human-induced by folks on land that they don't even realize it with marine debris being the big one and that's something I've been working with Oikonos on a little bit of that and producing some programs and curriculum to bring attention to the harshness of marine debris on the open ocean and the effect on marine wildlife, but can you talk a little bit about some of the information you've been working with

---

that you've been talking about plastics and I know that from my work with the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserves staff and the fish and wildlife out there, we've become buddies and they share some of their information with me in regards to what they're seeing on the islands in regards to what the birds are regurgitating and these boluses, this somewhat of an owl pellet with plastic in it and I know you've helped us here producing some materials too with plastics. So, can you talk a little bit about what we're learning and where we're going and what we can possibly do on land to prevent marine debris?

*David Hyrenbach:* Yeah. Before I do that I just want to say that, you know, fisheries are receiving a lot of attention and the high seas industrial-type fisheries, the problems of birds with those fisheries are getting fixed with a variety of new management regimes, but like you say, there's two big problems that are sort of looming. One is coastal fisheries, coastal gillnets, very small boats, artisanal fisheries, a bunch of, you know, two to three people going out on a small boat using gillnets in coastal waters. This is a problem for turtles and sharks and birds in many, many parts of the Pacific Ocean, but, you know, this is going to take a lot of effort to fix and people have very little ability to do something about it in the United States because we don't have these kinds of fisheries really operating in our waters.

We can take care of this issue as consumers, you know, making sure we buy fish products that are harvested in an environmentally sensitive way, not using destructive techniques. Another big threat where we can do more I think, as citizens of the United States, is the issue of plastic. Plastics are pervasive in our society. They're very long-lived and they end up in the ocean and when they end up in the ocean a lot of these animals, like you mentioned, surface-feeders, a lot of these albatrosses, other similar species like fulmars and storm petrels that feed at the surface by pecking individual pieces of food, these birds get confused, you know, they've lived in the ocean for a very, very long time and there were no plastics around and now they're faced with all this debris and they just pick it up as if it was a piece of food and this is a really big, big problem.

To give you an example of how pervasive this problem is, throughout the world, I'm going to give you a couple of statistics that are really staggering. So, a lot of work has been done in the North Sea. There's these birds called the northern fulmars, like a little albatross. There they...people went out and picked up dead birds from beaches. That's something that people participate in, for example, programs to monitor the health of the ocean by doing

---

beach walks, for instance. So, as part of one of these programs in Europe they found that ninety five percent of all the fulmars they found on beaches had plastic in their stomachs.

*Jennifer Stock:* Oh my gosh.

*David Hyrenbach:* There was one case which was...it's mind-blowing. This one bird that was retrieved from Denmark had twenty one grams of plastic in its belly.

*Jennifer Stock:* Oh my gosh.

*David Hyrenbach:* It's not a lot, but if you think of how small these birds are...

*Jennifer Stock:* Right.

*David Hyrenbach:* ...if you scaled this up to a person, it would have been comparable to you or I having two kilograms, four pounds...four and a half pounds of plastic in our stomachs.

*Jennifer Stock:* Wow.

*David Hyrenbach:* You see, it's just incredible, you know? So...

*Jennifer Stock:* And we don't exactly know...we probably can imagine that some birds are probably dying because they're not going to get any real food in there because their bellies are so full of plastic, but we're probably just starting to learn a little bit more about the long-term effects on their reproductive ability with those plastics in them.

*David Hyrenbach:* Yeah, it's been very difficult to do these kinds of studies because, again, these birds live for a really, really long time and now so many of them have already plastics in their stomach that it's not just whether they do or don't have plastic. Say, for albatross babies, like you said, the Laysan and black-foots, if you look at the pellets, those little balls almost like...

*Jennifer Stock:* The bolus?

*David Hyrenbach:* Yeah, the boluses. Those little pellets of un-digestible material that they regurgitate. Usually they have squid beaks that they cannot digest. One hundred percent of those contain plastic. So, now we know all the chicks have plastic in their stomachs and it's really hard then to really say, "To what extent is the plastic killing them?" You see, because it's such a pervasive effect and, you know, on top of that there's variability. In some years there's more food

---

than others and some parents are better parents than others and things like that and we cannot do experiments where we force-feed plastics to chicks to see what happens with them.

So, you know, it's a difficult phenomenon to characterize, but I think there's more and more research going into this problem to quantify how much debris and plastic there is in the ocean. How much the birds and other wildlife are ingesting of this debris and the effects.

*Jennifer Stock:* The plastic is coming, from what I understand, majority of marine debris we find on our beaches is from land-based sources coming through watersheds.

*David Hyrenbach:* That's right. The United Nations did a big study of this problem in the early nineties and they estimated that eighty percent of all the human-made debris is...excuse me, of all of the debris in the ocean comes from people activities, from land activities by people. So, basically, yeah, you know, when you, you know, you have your Coke and you drop the little bottle top, the red bottle top out the window of your car when you're driving around or you're careless and, you know, whatever, it falls out of your backpack or something, then it rains, it goes down the drain, it eventually ends up in a stream that takes it to a bay, then the currents pick it up. They take it out to sea and then it ends up in the belly of an albatross, you know?

*Jennifer Stock:* We have just about three minutes left so I want to wrap it up here, but I want to tell you one of the things we're doing out here and it's happening all over is lots of folks are doing much more...many more beach cleanups ever than before, which is wonderful, and it's for us it's...we know that there's more out there and if we pick it off the beach more is going to come the next day, but we're constantly trying to impact on visitors and folks that participate that they can participate in helping at home.

They don't have to come to the beach and just...cleaning up near their storm drains or at school or at work and that is more empowering than actually getting out to the beach and picking it up there because you're just preventing it from entering the watershed which is one of the biggest things that we can do as well as reducing the amount of plastic that we use. David this has been so fabulous to have you on the show and I can envision having you back again to go further into some of this plastic stuff because we didn't even get to touch on that as much I would have liked to, but

---

is there any last words or recommendations or websites you'd like to add before we sign off and end the show?

*David Hyrenbach:* You know, I would like to tell the readers...I mean the listeners to please visit the Oikonos website and follow the birds online and if you want to help fix some of these problems, there's three things you can do. First, you can read. You can learn about what the problems are, find out the scope of these issues in the ocean throughout the world. You can make better decisions as a consumer. Make sure you buy clean environmental fish. Make sure your garbage doesn't end up on streams and the ocean and also, you can be source of inspiration for other people, you know, because often these problems seem so big, but if we all do as much as we can and we inspire other people to participate and do something about it, I think together we can, you know, we can really make a difference.

*Jennifer Stock:* David, thank you so much. You're an inspiration, actually, to us and working with you in the sanctuary program has been wonderful, especially with the education help that you've been giving me and Carol Keiper at Oikonos. It's been fabulous working with you and I just want to thank you so much for talking with us about albatrosses and open ocean studies. It's really quite exciting and I can't wait to have you again on this show.

*David Hyrenbach:* I look forward to coming back, maybe once our tracking is done and...

*Jennifer Stock:* Oh, yeah! That's true!

*David Hyrenbach:* ...I congratulate you for a really cool show.

*Jennifer Stock:* Oh, thank you. Looking forward to it. I'll be talking to you soon.

*David Hyrenbach:* Okay. Buh-bye.

*Jennifer Stock:* Alright.

*David Hyrenbach:* Bye.

*Jennifer Stock:* I want to thank everybody for listening and tuning in to listen to David Hyrenbach. This has been really fascinating to talk to him. I always love hearing about things that I don't have a lot of exposure to and David's certainly been wonderful at bringing those to us. So, I want to sign off and we'll see you in about four weeks.